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**A card shuffler**

The invention relates to a card shuffler according to the preamble of claim 1.

A card shuffling apparatus has become known from US-PS 4,659,082 for example. In this known shuffling apparatus the shuffling vessel is formed by a horizontally arranged drivable drum which is provided with radially extending shafts for receiving a card each. An input station for receiving a stack of discarded playing cards is provided through which the individual shafts of the drum are supplied. The storage container for the shuffled cards is supplied by the drum. Following the activation of a card ejector, the individual cards are pushed into the storage container at random.

A similar card shuffler has become known from US-PS 4,586,712 in which the drum is arranged perpendicular.

A very high degree of shuffling is achieved with such card shufflers. The foreseeability of the card sequence in the shuffled card stack is virtually impossible for a third party even in the case of using electronic aids.

In these known solutions there are card storage means for retrieving the shuffled cards individually. This leads to the disadvantage, however, that such card shufflers can only be used for certain games, but not for such games where a removal in stacks of the shuffled cards is provided.

A card shuffling apparatus with an output apparatus for retrieving cards is described in US-PS 5,683,085 A which by way of a respective activation can be supplied from the shuffling storage means not only with individual cards, but

also with several cards, so that an entire stack of cards can be taken from the output apparatus.

From US-PS 5,989,122 A, a card shuffling apparatus is known which also conveys entire playing card stacks to an intended output apparatus.

The differentiation whether or not entire stacks of cards or merely individual cards are conveyed to the output apparatus is solved in the last two documents electronically. The output apparatuses per se remain the same and can thus not be adapted to the different card games.

It is the object of the present invention to avoid this disadvantage and to propose a card shuffler of the kind mentioned above which can be used for both types of games.

This is achieved in accordance with the invention in a card shuffler of the kind mentioned above by the characterizing features of claim 1.

The proposed measures lead to a modular arrangement of the card shuffler, with an exchange of the card storage means for the shuffled cards being possible in a simple way. A card storage means for the individual retrieval of cards can be replaced for example very simply by one for the retrieval of cards in stacks and vice-versa.

The features of claim 2 lead to the advantage of a very exact positioning of the exchangeable card storage means. The fixing of the same can occur very simply by means of a screw.

Principally, the receiving means can be provided with any desired arrangement and can comprise groove- and spring-shaped shapings, for example with which the card storage means and

the basic body mutually engage. The fixing can be provided by means of a fixable alignment pin for example. It is also possible, however, to provide connections by clips or snap-in connections such as spring-loaded balls or pins as receiving means for the card storage means which latch into respective latching recesses of the card storage means or the basic body of the shuffler.

The features of claims 3 and 4 lead to very simple solutions in a constructional respect for the different card storage means for the shuffled cards.

The features of claim 5 lead to the advantage that the content of each compartment of the shuffler storage means is securely pushed into a nip line between two rollers during the output which convey the same into the card storage means for the shuffled cards.

This also allows shuffling more than one card into a compartment of the shuffling storage means and thus keeping the card shuffler relatively small. This allows operating such a shuffler on a game table even when a larger number of card stacks, such as six or eight, are in the game and need to be managed. The nip rollers can either be provided with an elastically deformable coating or be pressed in a resilient way against one another which also allows an adjustment to the thickness of the content of the compartment to be ejected which can also hold several cards, e.g. a card stack with nine cards.

The features of claim 6 ensure a substantially slip-free drive which is controlled by way of a randomizer and optionally also causes oscillating movements.

The features of claim 7 or 8 are provided in a particularly preferable way. These measures ensure that the cards are held in the individual compartments and cannot slip outwardly by centrifugal force and thus prevent any contact of the cards with a housing enclosing the drum. This leads to a very substantial protection of the cards.

Moreover, in the case of any required exchange of a drum, it is not necessary to remove the cards from the compartment of the same. Instead, the drum including the cards contained in the same can be exchanged.

The features of claim 9 allow in a very simple manner to check the cards situated in the game. It is not only possible to check their number, but also the card picture, as a result of which any change of card can be recognized.

The invention is now explained in closer detail by reference to the enclosed drawings, wherein:

Fig. 1 schematically shows a card shuffler in accordance with the invention in which a cover has been removed;

Fig. 2 shows a top view of the input device;

Fig. 3 shows a detail of an output device;

Fig. 4 shows a card storage means for the one-by-one output of shuffled cards;

Fig. 4A shows a top view of the card storage means according to fig. 4;

Figs. 5 and 5A show details of variants of the arrangement of compartments of the shuffling storage means;

Fig. 6 shows an axonometric representation of the shuffling storage means;

Fig. 7 shows a security container with a shuffling storage means;

On a base plate 1, a shuffling storage means 2' is disposed on a console formed by two legs 9, which shuffling storage means is formed by a rotatably held drum 2. Said drum 2 is connected to two disks 3 via spacers 62 (fig. 6). The flanges 2" of the drum 2 are provided with compartment-like slots 69 which are provided for receiving cards.

Said disks 3 are each provided with a circumferential toothed 70. The shuffling storage means 2' can be driven via a pinion 4 and a toothed pulley 5 which is rigidly connected to the same and are jointly held rotatably in plates 25, and a toothed belt 6 via a second toothed pulley 7 and a motor 8. This motor 8 is triggered via a randomizer and optionally also moves the shuffling storage means 2' in mutually opposite directions, so that an oscillating movement of the shuffling storage means 2' can occur.

A reservoir 10 for the discarded cards 13 is provided which is part of an input apparatus. It comprises a wedge 11 which is rolled off by a roller 12 which is arranged rotatably within the same on an inclined floor of the reservoir 10 against two elastic rollers 14 (fig. 2). The two rollers 14 are rotatably held in the two plates 25 on a common shaft 28 and can be driven by way of two belt pulleys 26, a toothed belt 29 as well as a belt pulley 27 via a motor 17 jointly with the rollers 15. Two rollers 16 touch the two rollers 15 on the circumference, so that they can be co-rotated by surface friction.

A sensor 24 is provided as a line sensor for recognizing the card symbol of the respectively moved card 13.

The pair of rollers 19 and the pair of rollers 18 which touch the same on the circumference and are each situated on shaft 30 can be driven in the same manner as described above by motor 23.

The two levers 21 are used for the complete insertion of the respectively moved card into a compartment 69 of the shuffling storage means 2' and are oscillatingly drivable by way of a rod 22 which is swivelably connected with the lever 21 by the axle 34 by way of an eccentric disk 23 disposed on the motor.

Two variants are provided for the card storage means 42, 42' for the shuffled cards 13, which storage means can optionally be fastened to the base plate 1 and can easily be mutually exchanged.

A receiving means is provided which comprises two alignment pins 100 which are inserted in the base plate 1 and on which a card storage means 42, 42' for shuffled cards can be inserted which is provided in the zone of its floor with respective bores 102. In order to fix the respective card storage means 42, 42', a screw 101 is provided which engages in a threaded bore 103 of the card storage means 42, 42'.

The output of cards 13 from the compartments 69 into a card storage means 42, 42' is performed by means of two swivel arms 35 which are swivelably held in the two legs 9 and are oscillatingly drivable by way of levers 37 and by way of an eccentric disk 38 situated on a motor. Said two swivel arms 35 each carry at their upper ends an inwardly positioned rail 36 (fig. 3) which grasps the cards disposed in a compartment 69

and conveys them to a nip gap of two grip rollers 40. Said grip rollers 40 are held in the plates 45 and are simultaneously drivable by a motor 41.

The grip rollers 40 convey the respectively moved cards 13 either into the card storage means 42 for the shuffled cards as shown in fig. 1 for a stack-by-stack removal of the cards 13, or into a card storage means 42' for a one-by-one removal of shuffled cards.

A card storage means 42 is substantially formed by a U-shaped table 43 in which the cards 13 are deposited in a stack 44. The cards can be removed upwardly by the croupier stack-by-stack if necessary.

The reservoir 42' according to figs. 4 and 4A is provided for a one-by-one removal of cards 13. The cards emerging from the nip gap of the grip rollers 40 enter the card storage means 42' through a gap 50 which is limited by an oblique downwardly extending wall 49 and a spring-loaded shoe 47. The cards 13, which also include several of the same simultaneously, are pushed between the shoe 47 and the wall 49 or the cards already disposed in the card storage means 42', with the shoe 47 being pushed back against the force of the spring 48. The shoe 47 slides over an inclined plane of an L-shaped basic body 46. A gap 73 remains between the lower edge of the wall 49 and the L-shaped basic body 46, through which gap cards 13 can be retrieved one-by-one.

As is shown in fig. 4A, the inclined wall 49 is provided at its lower edge with a centrally arranged recess 72 which is open on its edge and facilitates the withdrawal of the individual cards. The card storage means 42' is limited on the side by walls 50. The shuffled cards can be retrieved by the croupier individually in that the respectively foremost of the

playing cards 13 is grasped through recess 72 in the wall 49 and is pulled through the gap 73.

As is shown in figs. 5 and 5A, springs 51, 52 are arranged in the compartments 69 of the shuffling storage means 2', which springs ensure the clamping of the card(s) inserted into the respective compartment 69.

The spring 52 is provided with a bending 55 which covers the radially outer openings of the compartments 69 and prevents securely that cards are ejected outwardly by centrifugal force during the rotation of the shuffling storage means 2'.

The springs 51 according to fig. 5A are arranged as curved or bent leaf springs and are inserted in a slot 53 of the one wall of the compartment 69 and press against the respectively opposite wall of compartment 69. The card inserted into the respective compartment 69 is clamped between said spring 51 and the opposite wall of compartment 69 and held in this way in the respective compartment 69.

The output of the cards of a compartment 69 is carried out in such a way that the card 13 or a stack of up to nine cards for example is ejected by force. This is carried out by means of the swivel arms 35 and rails 36, as already explained above. The springs 51, 52 are deformed during the ejection of the card(s) 13.

As is shown in figs. 1 and 6, drum 2 rests with axle journals 57 in receiving means of legs 9 and can be removed or lifted from the same with ease. Since the compartments 69 are provided with springs 51, 52, the cards 13 can remain in their compartments during the removal of drum 2.

The drum 2 can be placed in a security container 63 (fig. 7) and can be transported in the same, with the container 63 being sealable with a lid 64. For this purpose, flanges 65, 66 are fastened on container 63 and the lid 64. This allows connecting the container 63 with the lid 64 in a manner so as to be secure against manipulations or to lock the same.